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Longer-Term Economic Impacts of Self-Help Groups in India

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Abstract

Despite the popularity and unique nature of women's self-help groups in India, evidence of their economic impacts is scant. Based on two rounds of a 2,400 household panel, the authors use double differences, propensity score matching, and pipeline comparison to assess economic impacts of longer (2.5-3 years) exposure of a program that promoted and strengthened self-help programs in Andhra Pradesh in India. The analysis finds that longer program exposure has positive impacts on consumption, nutritional intake, and asset accumulation. Investigating heterogeneity of the impacts suggests that even the poorest households were able to benefit from the program. Furthermore, overall benefits would exceed program cost by a significant margin even under conservative assumptions.

This paper—a product of the Sustainable Rural and Urban Development Team, Development Research Group—is part of a larger effort in the department to better understand the impacts of decentralized governance and local development.. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at kdeininger@worldbank.org or yliu3@worldbank.org. .

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1. Introduction

India has long taken efforts to expand credit availability to rural areas. Early programs, which often yielded disappointing results, were gradually replaced by efforts to establish self-help groups (SHGs) and link them to banks. In 1992, India's National Bank for Agricultural and Rural Development (NABARD) piloted the concept with 500 groups. Since then, the SHG movement has witnessed tremendous growth that brought about one of the world's largest and fastest-growing networks for micro-finance. In 2007, some 40 million households were organized in more than 2.8 million SHGs that borrowed more than US$ 1 billion of credit from banks in 2006/7 alone (Reserve Bank of India 2008). Cumulative credit disbursed to SHGs amounted to some US$ 4.5 billion (or about 10% of total rural credit) in India (Garikipati 2008).

The SHG-led approach differs from traditional micro-finance in a number of ways. First, it does not exclusively focus on credit or savings but also includes emphasis on social empowerment, outreach, and capacity building. Recognizing that households' lack of human and social capital may prevent them from making good use of financial resources even if they had access to them, program organizers put a strong focus on encouraging the groups to establish regular meetings among group members and group savings. There is also an emphasis on outreach whereby existing groups are encouraged to help the "leftover poor" in their village to form SHGs. Second, the goal is not to establish a separate micro-finance institution but to use the group to intermediate in dealings with the formal sector and help households to create a "credit history" that will eventually allow them to access regular sources of finance. Finally, federation of SHGs is a central element not only with respect to peer monitoring and diversification of risks on the financial side but federations at village and higher levels are also used to assist in implementation of government programs, help SHGs provide other services -from technical assistance to marketing- and allow members' participation in local government.

This implies that India's SHG movement has many of the elements, such as "saver graduation" and a built-in tendency towards membership expansion, that have been identified as key to make micro-finance sustainable (Ahlin and Jiang 2008). Indeed, a large and growing literature discusses SHGs' evolution, their role in the broader financial system (Basu and Srivastava 2005, Sinha 2006, Shah *et al.* 2007) and recent innovative practices (Nair 2005). However, even within India, the geographical focus of SHGs was concentrated in few states; in fact 70 to 80% of SHGs are in the four southern states of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala and therefore, there is considerable scope for expansion. To justify such expansion, an in-depth quantitative assessment of the impact of the SHG model for micro-credit on key household level outcomes, in particular of its economic effects would be warranted.

Such an evaluation has to deal with a number of practical challenges: First, in many cases the success of SHGs made it attractive for policy makers to quickly expand the program, implying that establishing a control is not always easy. For example, in Andhra Pradesh (AP) a first phase targeted only 6 districts but a follow-up program to expand coverage to the entire state was launched less than 3 years after the launch of the original intervention. As the target group includes the poorest who require considerable training and capacity building before they will be in a position to be able to successfully use and repay loans, this may be too short to expect large economic impacts. Second, with clear benefits and economies of scale from federation, random selection of treated and control groups within sufficiently small administrative units (mandals, equivalent to counties) is difficult and, even if agreed upon at the start, may not be maintained during implementation. Finally, impacts are likely to differ according to participation status but participation is likely to be endogenous and thus needs to be controlled for.

This paper provides an evaluation of the SHG-based micro-credit model using a large-scale World Bank supported intervention in the state of Andhra Pradesh (AP) that included three elements of interest, namely (i) efforts to foster formation of SHGs by the "leftover poor"; (ii) capacity building for existing SHGs and establishment of second tier institutions at the village and mandal (county) levels to use economies of scale in capacity building, credit and insurance, and interaction with the public and the private sectors in larger-scale programs; and (iii) a one-time injection of equity to the second tier institutions aiming to provide them with seed capital to remedy the multiple market and government failures typical of rural India.

The data to do so are from a 2,400 household panel based on two surveys, conducted in 2004 and 2006, in treatment mandals where the program had started in early 2001 and a set of randomly chosen control mandals where the program became available in late 2003. We compare the outcomes between program SHG participates in the treated counties and those in the control area had not yet reached maturity, our results can be interpreted as providing an estimate of 2.5 year program exposure by mature groups, rather than participation per se. Double differences are used to eliminate bias due to time-invariant factors. Also, to address differences in observables that may limit comparability between treatment and control households, propensity score matching methods are used. Moreover, we allow for heterogeneity of impact by letting impact differ by SHG participation status or initial poverty status for SHG members' counties by relying on the assumption that unobservable attributes of these groups are not significantly different between treatment and control areas.

Our results point to significant economic gains from program participation in the form of better nutrition and higher levels of consumption as well as asset accumulation, for SHG participants but not for those who are merely living in program areas. Differentiating by participants' poverty status suggests that the

program helped the poor to increase consumption, nutritional intake and asset accumulation whereas the poorest of the poor experienced nutritional gains and increased their level of asset accumulation but not consumption. This suggests that, for households targeted by this type of program, economic impacts will materialize over time. More importantly, with different impacts depending on participants' initial wealth level, adapting interventions to the intended target group can have benefits. The fact that the program became available in the control counties since late 2003 suggests that our estimates provide a lower bound of the program's term impact. Therefore, a side benefit of our analysis is that it allows us to obtain an empirical estimate of the cost-benefit ratio of the program.

The paper is structured as follows. Section two describes key features of the program and links our analysis to the literature. On the basis of a brief discussion of data and descriptive statistics, section three identifies hypotheses to be explored. Section three also describes the empirical strategy which combines pipeline comparison, double differences, and propensity score matching. Section four presents estimation results for the overall sample and for subgroups defined by their participation and initial poverty status. Section five concludes and draws some implications for program design and future research.

2. Program description and data

The program of interest combines micro-credit and savings generation with social empowerment in an innovative way that can be illustrated through descriptive statistics at household- and group-level. While earlier literature shows that such programs had positive impacts on social and economic empowerment, there has been little evidence on economic effects. Our setting, which provides an estimate of the impact of some 2.5 years of additional program participation by mature groups, could be of broader interest.

2.1 Key program characteristics

The SHG model in India combines savings generation and micro-lending with social mobilization. A typical SHG consists of 10-20 members who meet regularly to discuss social issues and activities and, during these meetings, deposit a small thrift payment into a joint bank account. Once enough savings have been accumulated, group members can apply for internal loans that draw on accumulated savings at an interest rate to be determined by the group. Having established a record of internal saving and repayment, the group can become eligible for loans through a commercial bank, normally at a fixed ratio (normally starting at 4:1) to its equity capital. Rules adopted by the group specify the periodicity of meetings, the amount to be saved per meeting, the length of repayment period, the interest rate to be charged on internal and external loans which can be higher than that at which the loans are received, as well as the amounts and mechanism by which loans are allocated.

To promote formation of new SHGs and strengthen existing ones in the state's six poorest districts, the Government of AP implemented the District Poverty Initiatives Project (DPIP) over the 2001-2006 period. Supported by a US$ 110 million World Bank loan, this program had organized 2.29 million households from 316 mandals in 171,618 SHGs and federated them into 9,872 village organizations (VOs) at the village level and 316 mandal samakhyas (MSs) at the mandal (county) level by December 2006 (World Bank 2007). The main idea of this program was to link capacity building with a one-time infusion of equity capital to not only form new SHGs but also establish them as economically viable and self-reliant institutions. To do so, a three-pronged strategy was adopted.

First, efforts to induce formation of new SHGs to include poorer strata of the population who had been left out of earlier attempts were undertaken. To determine the target group, the state's 2001 "below poverty line" census which is routinely used to determine eligibility for government programs was complemented by a large effort of "participatory identification of the poor" (PIP) that added vulnerability and social exclusion to quantitative census indicators. The resulting lists, which assigned all households to the poorest of the poor (POP), poor, middle class, or rich, were confirmed by village assemblies.[1] Resources, in the form of community organizers, were then made available corresponding to the number of target households, to help form new groups that would achieve near-universal coverage.

Second, existing and newly formed SHGs were to be strengthened through set up and support of a federated SHG structure at village, county (mandal), and district (zilla) levels through Village Organizations (VOs), Mandal Samakhyas (MSs), and Zilla Samakhyas (ZSs). A VO includes about 20 SHGs in the village and is governed by an executive committee to which each member SHG sends two representatives. A number of other committees, depending on need, are formed as well, and a similar pattern is followed at mandal and zilla levels. In addition to being able to obtain loans wholesale from Banks and on-lend them to members, VOs and MSs also take over implementation of government programs and provide a link between their membership and local government institutions. One important program intervention is the so-called rice credit line (RCL). This enables the VO to acquire subsidized rice under the public distribution system in bulk and make it available to SHG members as an in-kind credit with any savings from bulk purchase being passed on to members in the form of lower prices. Anecdotal accounts suggest that this allowed the poor to circumvent the well-documented problems of the public distribution system (Kochar 2005) and thus was widely popular. The prospect of reliable rice

[1] The manual used in the process defines poorest of the poor as those who Can eat only when they get work and who lack shelter, proper clothing, respect in society, and cannot send their children to school; The poor have no land, live on daily wages, and need to send school going children to work in times of crisis. The 'not so poor' "middle class" have some land, proper shelter, send their children to public schools, are recognized in society, and have access to bank credit as well as public services. The non-poor rich, having land of at least 5 acres, no problem for food, shelter, clothing, can hire laborers, send children to private schools, use private hospitals, lend rather than borrow money, and have considerable social status..

supplies at below-market prices also helps to attract new members and establish a discipline of meeting attendance, saving, and (re)payment.

A final element of the project strategy is to support the building of capacity and equity. As weak capacity had been a key reason for the failure of earlier credit and saving programs, the program placed strong emphasis on forming training institutions in each mandal to train leaders and accountants from new SHGs in basic management and accounting, making available trained "master book keepers" to check the accounts of SHGs, and supporting community assistants to provide technical assistance to the start-up and conduct of entrepreneurial activities. The main instrument to assist in rapidly building up group equity was the community investment fund (CIF) which was made available to SHGs for on-lending to their members and to provide collateral for borrowing from banks. This allowed to jump-start lending and provided the group with a reliable source of income and profit in the form of interest payments.[2] Spreads earned in this way provide a source of revenue that may be used for economic activities such as adding value to local agricultural production through marketing or processing, or social mobilization.

Despite considerable interest in promoting SHGs that spawned many tools to help with implementation, evidence on economic impacts has been very limited. A survey in one of the first SHG-districts finds that, at a qualitative level, SHGs helped reduce vulnerability to drought, encouraged entrepreneurial behavior and livelihood diversification, and improved social capital (Garikipati 2008). Positive empowerment impacts on SHG participants are also found from a larger five-state sample (Swain and Wallentin 2008).

Studies of the AP project considered here support the general conclusion of a significant and positive impact on social empowerment but are less clear on economic impacts. One study concludes that, while the project had a positive impact on risk coping, some aspects of female empowerment, and non-food expenditure, a lasting impact on livelihood activities is unlikely (Lastarria-Cornhiel and Shimamura 2008). Similarly, after three years of implementation, SHG participants had improved their nutrition and social empowerment but there were no significant impact on economic outcomes such as income or asset accumulation (Deininger and Liu 2009). Below, we test whether economic effects materialized at subsequent stages of group development.

2.2 Data description and household level evidence

We rely on two survey rounds at household and group levels conducted from February to June of 2004 and August to October of 2006. The survey covers 51 mandals from three districts (Anantapur, Adilabad and Srikakulam) which were chosen to represent the state's three macro-regions (Rayalaseema, Telangana, and Coastal AP). Out of the 51 mandals, 41 were assigned to be treatment where the program

was made available in 2001 whereas 10 were randomly assigned to a control where the program could be accessed only from 2003.[3] To ensure sufficient coverage of the target group, poor households were oversampled using the lists that classified all villagers by poverty status based on census data.[4] The household sample consists of 1,877 and 529 households in treated and control mandals, respectively. Male and female parts of the instrument were administered separately – and as far as possible simultaneously – to the main male or female person in the household, normally the head and spouse.[5]

Household-level outcome variables include consumption, nutritional intake, and assets. Consumption includes food and non-food consumption over the past 30 days and more lumpy items over the past year.[6] We compute the amount of calories and protein consumed by multiplying physical quantities of more than 30 food items in the questionnaire's consumption section each with their caloric and protein content based on the main reference for Indian foods (Gopalan *et al.* 2004).[7] Non-financial assets include consumer durables, productive, and livestock assets.[8] Throughout, consumption and asset are expressed in per capita terms based on adult equivalent measures.[9]

Household level outcome variables are illustrated in table 1 for control and treated mandals separately for the periods of 2003/2004 and 2005/2006. While nutritional intake was close for households in the control and treated mandals, total consumption was lower for the treated than the control in both years. Households in treated mandals owned more non-financial assets than those in the control mandals in both years. Table 2 summarizes household demographics and initial conditions for the whole sample, control and treated mandals separately. Although control mandals were supposed to be randomly selected,

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[2] While the CIF was initially made available to SHGs, it was shifted to VOs and later on to MSs as soon as these were established.

[3] Three districts (Anantapur, Adilabad and Srikakulam) were chosen to represent the state's three macro-regions and mandals were selected randomly. Out of the 51 sampled mandals, 41 were assigned to be treatment, implying that the program was made available from 2001 whereas 10 were randomly assigned to be controls implying that the program could be accessed only from 2003. Among the 10 control mandals, four are from Srikakulam, two from Anantapur, and four from Adilabad. Villages, groups, and households were then selected randomly in each mandal.

[4] Sampling fractions are 0.4 for the '"poorest of the poor'", 0.3 for the 'poor'"poor", 0.2 for '"not so poor'" households, and 0.1 for '"non- poor'" households. All descriptive statistics reported below are adjusted using thesecorresponding weights.

[5] For example, information on health, consumption, and female empowerment, among others, was obtained from the female while information on agricultural production was obtained from the male.

[6] Although the survey instrument is less disaggregated than that used by the National Sample Survey (NSS), it follows the overall structure used there.

[7] For fruits or vegetables where the survey includes only aggregate spending, we use the 55th round of the National Sample Survey (NSS) to derive the price and caloric content of a representative basket of these consumed in Andhra Pradesh.

[8] Financial assets were excluded due to concerns about misreporting. Asset values were measured as in December 2003 in the 2004 survey and in June 2006 in the 2006 survey.

[9] The adult equivalent measures for caloric and protein consumption are obtained using nutritional requirements by sex and age as weights, i.e., weights are 1.2 for adult males, 0.9 for adult females, 1.0 for adolescents (12 to 21 years), 0.8 for children aged 9 to 12, 0.7 for children aged 7 to 9, 0.6 for children aged 5 to 7, 0.5 for children aged 3 to 5, and 0.4 for children younger than 3 (Gopalan *et al.* 2004). For income and overall consumption, we assign weights to be 0.78 for anyone older than 60 or younger than 14.

discrepancies between the treated and the control persisted. This imbalance on household characteristics may derive from the fact that randomization is at the mandal level and the small number of mandals in treatment and control areas (41 and 10, respectively).

2.3 SHG level evidence

In each village, the 2004 survey also canvassed six randomly selected SHGs with a group level instrument that included retrospective information going back to 2001. The 2nd round revisited all SHGs included in the original sample, plus up to two newly formed groups per village.[10] Table 3 presents participation rates of program SHGs based on household-level data and summarizes SHG activities based on SHG-level data in treatment and control areas in 2001, 2003 and 2006, respectively. Note that 2001 is the start year of the program, 2003 is when the program had been active for three years in treated but had just started in control areas, and 2006 is when both had been exposed to the program for three or six years, respectively. The SHG survey includes program and non-program SHGs. However, most non-program SHGs converted to program SHGs by 2006. Overall participation rates point towards increased program coverage over time in both treatment and control areas, with a clear lag in the latter. In 2006, about 46% of households in the treated areas and 33% households in the control areas participated in program SHGs. Participation by the poorest and poor households is considerably larger than that of more affluent ones, in line with the program's intention to target the poor.

In both areas, SHG numbers increased by about 60% from 2001 to 2003, pointing to possible spillovers. One notes clear improvements in the level of group activity and adherence to rules over time for SHGs in both control and treatment areas, with some lag in control mandals. In treatment areas, the share of groups that met at least monthly rose from 48% in 2001 to 71% in 2003, where it more or less leveled off. By comparison, there is very little change in meeting frequency for the control before 2003 (from 0.46 to 0.50) but a marked increase, to 79%, thereafter. Virtually all SHGs indicated that members made savings in meetings throughout the 2001 to 2006 period. The data also suggest that the program helped increase activity in areas such as insurance, nutrition, marketing, and training which are the responsibility of VOs and MSs. In 2003, interventions to reduce vulnerability (i.e. food credit, insurance and disability programs), to provide RCL, and to help access markets were implemented by 49%, 40%, and 10% of treated groups, with increases to 71%, 54%, and 22%, respectively, in 2006. Groups in the control areas lagged in such activities in both 2003 and 2006 although about 17% (vs. 22% in treated areas) implemented job training programs for SHG members.

[10] Attrition was higher at the group than at the household level, with about 10% of program SHGs and 22% of non-program SHGs having disbanded between the two surveys. In SHGs that existed in both periods, 6% of households included in 2003 could no longer be found in 2006.

Data regarding the lending portfolio point towards a marked increase in recorded internal lending and access to bank loans and the project-supported CIF. The share of groups in treatment areas that practiced internal lending increased from 28% in 2001 to 55% in 2003 and 86% in 2006, compared to 30%, 38%, and 90% in the control group. Still with a median size between Rs. 4,500 and Rs. 10,900, loan sizes remained modest. In 2001, a very small share (4%) of groups in the treatment area started to access program funds (CIF), a share that increased to 25% in 2003 and to 62% in 2006. Although no groups in the control area had access to CIF in 2001 or 2003, they caught up thereafter, with 55% having access in 2006. At four to 10 times the median internal loan size, CIF resources were larger and more likely to be used for investment than internal lending which served mainly to smooth consumption.

In line with the program's goal of linking SHGs to commercial banks, access to bank loans increased for groups in both control and treatment areas during 2003-2006. The rather slow increase between 2001 and 2003 in treatment areas suggests that access to bank loans is not immediate and points to startup problems associated with developing the program implementation structure. At the same time, the median size of such loans (which were on-lent internally by the group) increased from R 15,000 to R 50,000, highlighting the increased credit-worthiness of the groups, partly due to the CIF funds. Median size and length of internal loans (some R 6000 in 2003 and R 10,000 in 2006; 12 months) were lower than those of bank loans and CIF resources and about half of internal loans were used for consumption smoothing.

3. Identification strategy and hypotheses

To do justice to the program's broad scope, we use a combination of DD and propensity score matching to assess program impacts it will be of interest to assess impacts on nutrition, consumption, and asset accumulation. As these are likely to vary not only between treatment and control area but also between SHG participants and non-participants and, for the latter possibly by initial wealth status, we use different ways of defining treatment and control to be able to make inferences on these.

3.1 Identification strategy and approach

Rather than assessing only the average treatment effect on the treated, we are interested in three impact estimates, namely (i) mean program impact on all households in program villages, equivalent to intention to treat; (ii) average treatment effects (ATE) on direct participants in program SHGs; and (iii) possibly heterogeneous impacts on program SHG members based on their initial poverty status.

To evaluate mean program impact, we use information from households located in the control areas as a control for those in treated areas, irrespective of participation status. As the program became available to the latter in 2001 and to the former in 2003/4, the "treatment effect" in our sample refers to the difference of impact between some 5.5 years and 3 years of program exposure. Our estimate will thus constitute a

lower bound of true program impact that can be interpreted as impact of program exposure for mature groups. To address possibly non-random nature of program placement, we combine difference-in-difference (DD) estimates with propensity score (PS) matching as explained below.

As households are self-selected into program SHGs, credibly estimating ATE on program SHG participants requires adjusting for differences in observable and unobservable characteristics of this group. To do so, we use the fact that we know participation status of control households in 2006, after the program had been made available to them to define an appropriate control. That is, we use participants in the control mandals to form a control for participants in the treatment mandals. This strategy is essentially a pipeline comparison. By so doing, combined with DD, we circumvent the self-selection problem by assuming unobservables that jointly affect sequential changes of outcomes and self-selection into program SHGs are identical for participants in treatment and control areas. PS matching method is then used to balance the treated and the control samples in terms of observable attributes. Similar to the estimates for mean program impact, our estimates here constitute a lower bound of the true impact of program SHG participation as the control mandals started to have access to the program in late 2003. Since 2.5 to 3 years is considered to be close to the time period required for newly formed groups to fully develop and attain a certain level of maturity, this can be interpreted as difference in performance between mature and non-mature groups exposed to the program. In order to see whether the program generated some spillover effects (through SHG participants), we estimate the ATE on non-participants of program SHGs in the treated mandals, using non-participants in the control mandals as a control. Figure 1 illustrates treated and control groups in estimating ATE on program SHG participants and non-participants, respectively.

To check possible interactions of program impact with initial wealth, we use households' initial poverty ranking (poorest of the poor, poor, and non-poor) that was established before program start as a classification variable. Program SHG members in the corresponding wealth group in control mandals, based on 2006 participation status,, can then serve as a control for those in treatment mandals, allowing us to estimate impacts on SHG member households by their initial poverty category.

To illustrate our approach, which combines difference-in-difference and PS matching, let $D = 1$ if a household is treated and $D = 0$ otherwise.[11] Let corresponding outcomes at time t be denoted by (Y_t^1, Y_t^0). The gain from treatment is $(Y_t^1 - Y_t^0)$ and we are interested in the average effect of treatment on the treated (ATT), $E(Y_t^1 - Y_t^0 \mid D = 1)$. As is known, the inability to observe treated households in state 0 prevents us from estimating the ATT directly. As we observe outcomes from 2003/4 and 2005/2006, we use DD to control for household fixed effects. With *t* denoting 2005/6 and *t*-1 2003/04, the

[11] Note that "treatment" is defined as having been exposed to the program for 5.5 years as compared to 3 years for the control.

standard DD estimator $E(Y_t^1 - Y_{t-1}^0 \mid D=1) - E(Y_t^0 - Y_{t-1}^0 \mid D=0)$ provides an unbiased estimate of ATT conditional on $E(Y_t^0 - Y_{t-1}^0 \mid D=1) = E(Y_t^0 - Y_{t-1}^0 \mid D=0)$. However, this condition will not hold if household characteristics or initial conditions affect subsequent changes of the outcome variables and have different distributions in the treatment and control groups.

To account for this, we combined the DD approach with PS matching to balance household characteristics and initial conditions.[12] The assumption underlying PS matching is that, conditional on observables, the outcome change if not treated is independent of the actual treatment, i.e., $[(Y_t^0 - Y_{t-1}^0) \perp D \mid X]$. This has been shown to imply $[(Y_t^0 - Y_{t-1}^0) \perp D \mid P(X)]$ where $P(X)$ is the propensity score, defined as $P(X) = \Pr(D=1 \mid X)$ which, by definition, takes a value between 0 and 1 (Rosenbaum and Rubin 1983). We use a PS-weighted regression method (Hirano *et al.* 2003) which recovers an estimate of the ATT as the parameter β in a weighted least square regression of the form

$$Y_{it} - Y_{i,t-1} = \alpha + \beta D_i + \varepsilon_i, \tag{8}$$

where *i* indexes household, and weights equal one for treated and $\hat{P}(Z)/[1-\hat{P}(Z)]$ for non-treated observations. See (Chen *et al.* 2007, van de Walle and Mu 2007) for empirical applications of this method.

Moreover, to obtain consistent and efficient estimates, we determine the common support region by

$$A_{10} = \left\{ X \mid \hat{P}(X) \le \lambda \right\} \tag{9}$$

where $\lambda = 1$ if

$$\sup_X \frac{1}{1-\hat{P}(X)} \le 2E\left[\frac{1}{1-\hat{P}(X)} \mid D=1 \right], \tag{10}$$

and λ is a solution to

$$\frac{1}{1-\lambda} = 2E\left[\frac{1}{1-\hat{P}(X)} \mid D=1, \hat{P}(X) \le \lambda \right] \tag{11}$$

otherwise. It has been shown that under homoskedasticity this trimming method minimizes the variance of the estimated ATT (Crump *et al.* 2007). Our results are based on trimmed PS-weighted DD throughout.

[12] Cluster at the village level was used throughout to control for village-level random effects.

We also report the results for the untrimmed simple DD to highlight that trimming and matching will be needed even if mandals were randomly selected.

3.2 Outcome variables of interest

Evidence thus far suggests a number of hypotheses regarding program impacts. First, as in-kind credit for food was an important tool to induce group formation, we would expect changes in nutritional intake, especially in the early phases of program implementation. The cows or buffaloes for milk production which many of the groups acquired with credit funds would also improve access to protein. Second, participation in groups and the access to internal lending it provides should not only reduce vulnerability and improved nutrition but also enhance income. Third, improved credit access, especially use of bank and CIF loans, should further encourage investment and asset accumulation.

As access to CIF resources, bank loans, and in-kind credit for food were targeted towards SHG members, we expect benefits to be limited to group members. Given the direct resource transfers involved and the fact that these are limited to SHG members, it is less likely that non-SHG members in the treatment area also benefited (e.g. from marketing activities or insurance programs) through spillover effects. Moreover, to the extent that SHGs offer members a menu of options the realization of which depends at least partially on wealth, the nature and magnitude of effects even for SHG participants may be affected by initial endowments. For example, in-kind credit and internal lending will be particularly attractive for the poor, while marketing provide larger benefits to the non-poor. At the same time, the poor and non-poor may also differ in how to use loans, and the poorest may not want to take out large loans due to lack of complementary assets or skills or just because of the fear of not being able to repay.

4. Estimation results

The methodological framework discussed provides estimates of program effects overall and for different groups. Positive and significant effects on SHG members' expenditure, nutritional intake, and asset accumulation appear to be driven mainly by poor participants. Interestingly, the poorest significantly increased asset accumulation but not consumption. Lack of significant results for non-poor participants may be attributed to limited power arising from the small sample size rather than the absence of impact.

4.1 Selection equations and mean program impacts

Table 4 presents logit regression results of program placement overall (col. 1) and for SHG-participants and non-participants (cols. 2 and 3). In each case, the dependent variable is 1 if the household (in the sub-group of interest) is located in a treated mandal and 0 otherwise. Household demographics (location, caste, female headship, and literacy) and initial economic conditions (poverty status, land ownership, consumption, nutritional intake, and non-financial assets) serve as explanatory variables. While the low

pseudo R^2 is in line with random selection of control mandals, results in col. 1 suggest that the program did target the poorest of the poor and scheduled tribes/castes. Land ownership is marginally significant and one notes regional differences in the extent of program implementation across regions. Estimated propensity scores are then used to balance these variables that may influence outcomes. Appendix table A1 displays simple differences between treatment and control for the untrimmed and the PS-weighted and trimmed samples overall (cols. 1, 2), for participants (cols. 3, 4), and non-participants (cols. 5, 6). While there are a few significant differences in the unadjusted sample, trimming and matching based on the estimated PS balance all variables of interest.

Estimates for average treatment effects on households in the treated mandals based on the trimmed sample are reported in the bottom panel of table 5 with simple DDs based on the total sample included in the top panel for comparison. We note a significant impact on investment in non-financial assets which is estimated to be higher by R 581 or 16% for treated as compared to counterfactual based on the PS-weighted DD regression using the trimmed samples. This suggests that once groups did achieve a level of maturity, the program's objective of inducing higher investment and capital formation was achieved. However, we fail to find significant impact on consumption or nutritional intake. As the estimated impact is an average over SHG members and non-members in program villages, it is possible that program effect on members in terms of consumption and nutrition may not be detected at standard significance levels and we turn to exploring the impact on SHG members to obtain further insight.

4.2 Impacts by type of SHG participation and initial poverty status

Table 6 reports the estimated ATE on program SHG participants and non-participants in treated mandals separately. Contrary to the lack of such significance for the overall sample, we find significant impacts on consumption, nutritional intake, and asset accumulation for SHG members. None of these variables is significant for non-members, though, suggesting that spillover effects are limited, if at all present. The magnitude of estimated impacts is quite large; for participants, the increment in per capita consumption compared to the counterfactual is estimated to amount to R 864/year (about US$ 16.8) per capita or some 11 percentage points. Estimated increases in per capita intake of energy and protein and investment in non-financial assets amount to 10 (210 calories/day), 16 (7 gram/day), and 23 (R 720) percentage points, respectively. These are large effects, especially because a number of factors, such as cross-border spillovers and learning by the agencies responsible for implementation, will bias estimates downwards and in view of the fact that non-negligible gains in nutritional intake may already have occurred during the program's initial three years (Deininger and Liu 2009). The observed pattern could be due to the nature of the interventions that aimed to help households diversify their diet and access higher quality food by allowing households to consume products (e.g. milk) from livestock acquired through CIF funds.

To make inferences on total program benefits, we note that, by the time our survey was undertaken, the program had reached a total of 2.29 million households with average household size being 4.4 after adjusting for adult equivalence. Multiplying the estimated ATE on participants' consumption per capita (US$ 16.8) with the number of participating individuals, assuming that future benefits will at least be maintained at the current level, and applying a 0.9 discount factor, would imply a net present value of benefits from the project of about US$ 1,690 million, significantly above the project cost (US$ 110 million). Even under the conservative assumption that consumption benefits only lasted for one year the estimated benefits still significantly exceed project costs, with a benefit-cost ratio of 1.5:1.

In view of the significant differences in human and physical capital endowments in the project area, it would not be too surprising to find that the project affected poor and non-poor participants differently. Evidence of such differential impact could, for example, help to adapt the intervention more closely to the need of its intended target groups. To obtain further insight into this, we estimate impacts on participants with different initial poverty levels.[13] Estimated impacts for each sub-group and test results for differential impacts across sub-groups are reported in table 7. We find positive and significant impacts on per capita consumption (R 1218/year, R 511 of food and R 707 of non-food consumption), nutritional intake (321 Kcals/day in energy and 7.54 g/day in protein intake), and asset accumulation (R 1194) for initially poor households. The increase in consumption and nutritional intake is around 15% of the counterfactual, the increment in asset endowments is as high as 26%. For the poorest of the poor, estimated impacts on per capita nutritional intake (286 Kcals/day in energy intake and 6.85 g/day in protein intake) and asset accumulation (R 757) are statistically significant. However, we find only marginally significant impacts on consumption. Although the magnitudes of estimated impact for the poorest households are lower that those for the poor households, the percentage change in nutritional intake is about the same and the percentage change in asset (about 50%) is much higher than the latter. At the same time, no or only marginally significant impacts are detected for the non-poor members.

[13] Appendix table A4 lists means of outcome variables for our sub-groups of POP, Poor, Non-Poor members separately. Not surprisingly, descriptive statistics suggest richer households had higher consumption and asset than poorer ones in both periods. We can see the same trend for nutritional intake though not as obviously as consumption and asset.

4.3 Power analysis

To assess how confident we can be to claim that failure to detect impacts is due to the absence of economically meaningful impact rather than just low power of our tests, we compute, for each of the cases where we fail to obtain significant impacts, the probabilities of type 2 error (i.e. of wrongly accepting the null hypothesis) if the actual impact is 10% or 5% of the counterfactual. The formula used is $\Pr = \Phi\left[\left(A\hat{T}T - x\% \cdot CF\right) / se\left(A\hat{T}T\right)\right]$, where $\Phi(.)$ is the cumulative distribution function of the standard normal distribution, CF denotes the counterfactual, and *se(.)* the standard error. Under the assumption that an impact equal to x% of the counterfactual is an appropriate lower bound of economic significance, a low probability thus implies that we can be confident of no impact, and a high probability indicates a low power of our test.

Results are reported in table 8 for non-members (col.1-3), the poorest of the poor (col. 4-6), and non-poor (col. 7-9). For non-members, the very low probabilities for food consumption and nutritional intake (less than 3%) provide strong evidence against spillovers for these variables. For asset accumulation, the probability is relatively high, suggesting that we have no evidence to either support or reject the existence of spillovers. We can see that the power of the test is very low for consumption for the poorest of the poor members and for asset accumulation by non-poor members. Clearly, and in line with evidence of these impacts being significant at 10% level for a one-sided test, the lack of statistical significance in this case may be due to low power of the test given the small number of observations of the non-poor (only 154). By comparison, the power is relatively high for food consumption and energy intake by non-poor members, in line with the notion that these groups have either already attained their desired levels of these variables or that whatever effect was due to the program already materialized during the first three years of program implementation.

5. Conclusion

This paper was motivated by the fact that, despite considerable interest in SHG-based approaches to micro-finance, rigorous evaluations of the impact of such intervention are still scant and that even studies pointing to clear social, empowerment, and nutritional impacts were unable to ascertain economic effects. Availability of data between 3 and 6 years after group formation allows us to make inferences on whether such an inability is due to the lack of impact or the fact that, in view of the target groups' deficient human and physical capital endowments, economic effects may take longer to materialize. As a corollary, we can check whether economic effects are limited to those in the target group who are more entrepreneurial.

Using propensity-score weighted double differences on an appropriately trimmed sample and noting that for various reasons our estimates will constitute a lower bound of true effects, we find that, in the areas

considered, SHG participation had significant economic impacts. Assuming that benefits will be maintained at current levels, benefits significantly exceed program costs. Interestingly, benefits were not confined to those who had been more affluent to start with; in fact there is significant asset accumulation among the poorest of the poor who, partly as a result and partly due to the fact that gains in calorie and protein intake had already been realized shortly after program start-up, saw their consumption increase by less than the poor. This implies that, to the extent that they participate in SHGs, the poorest seem to be able to benefit not only socially but also economically. We failed to detect significant impacts on the non-poor, likely due to low power of our tests given the small number of observations of the non-poor.

Our results suggests that a program that not only fosters group formation but also supports more mature groups through federation and credit access can have significant economic benefits in the long term. To assess the overall desirability and impact of such programs, a key question relates to the extent to which benefits will be maintained once outside support is terminated. The answer will at least partly depend on whether either the SHGs established by the program continue to operate – possibly adjusting the services offered to the level of member development – and, related to this, whether beneficiary households will be able to use the one-time injection of credit and capacity to push them on a permanently higher trajectory of economic activity and asset accumulation. Answering this question is beyond the scope of this paper and will require additional information based on group and individual activity after external support had been terminated. Still, the fact that we find non-negligible economic impacts in the case of AP implies that probing further in this direction to assess determinants and implications of the sustainability of SHGs and the benefits they provide to their membership could be of considerable interest for researchers and policy-makers alike.

Table 1. Sample means and standard deviations of outcome variables in treated and control households

	2003/2004				2005/2006			
Variable	**Control**		**Treated**		**Control**		**Treated**	
Consumption p.c. (Rs/year)	7920	(4386)	7226	(3820)	8748	(4247)	8582	(4140)
Food (Rs/year)	3886	(1768)	3695	(1612)	4298	(1850)	4146	(1796)
Non-food (Rs/year)	4034	(3164)	3531	(2794)	4450	(3196)	4436	(3031)
Energy intake p.c. (Kcal/day)	2111	(712)	2144	(691)	2343	(979)	2322	(887)
Protein intake p.c. (g/day)	49	(18)	51	(18)	49	(19)	50	(18)
Total non-financial assets p.c. (Rs)	3133	(3781)	3506	(4248)	3605	(4671)	4438	(6086)
Number of observations	526		1880		526		1880	

Source: Own computation from 2004 and 2006 SERP/CESS impact evaluation surveys. Sample weights applied.

Table 2. Sample means and variances of household demographics and initial conditions

Variable	All		Control		Treated	
Household lived in hamlet	0.20	(0.40)	0.17	(0.38)	0.21	(0.40)
Scheduled caste	0.13	(0.34)	0.18	(0.38)	0.12	(0.32)
Scheduled tribe	0.16	(0.37)	0.05	(0.22)	0.19	(0.39)
Backward caste	0.54	(0.50)	0.57	(0.50)	0.53	(0.50)
Other caste	0.17	(0.38)	0.20	(0.40)	0.16	(0.37)
Household size	4.94	(2.07)	4.56	(1.93)	5.05	(2.10)
Household female headed	0.11	(0.31)	0.12	(0.33)	0.10	(0.30)
Some member can write	0.84	(0.37)	0.82	(0.39)	0.84	(0.36)
Poorest of poor	0.25	(0.43)	0.24	(0.43)	0.26	(0.44)
Poor	0.27	(0.44)	0.27	(0.45)	0.27	(0.44)
Not very poor	0.24	(0.43)	0.27	(0.45)	0.24	(0.43)
Not poor	0.23	(0.42)	0.22	(0.41)	0.24	(0.43)
Land ownership	0.72	(0.45)	0.67	(0.47)	0.73	(0.44)
Located in Telangana	0.30	(0.46)	0.35	(0.48)	0.29	(0.45)
Located in Rayalaseema	0.38	(0.49)	0.29	(0.45)	0.40	(0.49)
Located in Coastal AP	0.32	(0.46)	0.36	(0.48)	0.30	(0.46)
Number of observations	2406		526		1880	

Source: Own computation from 2004 and 2006 SERP/CESS impact evaluation surveys. Sample weights applied.

Table 3. Summary of SHG activities

	2001			2003			2006		
	Control	**Treated**		**Control**	**Treated**		**Control**	**Treated**	
Participation rate of program SHGs									
Overall participation rate	0.0%	10.5%	***	29.5%	42.2%	***	33.4%	45.6%	***
% participated of very poor households	0.0%	12.6%	***	29.4%	49.8%	***	36.9%	54.1%	***
% participated of poor households	0.0%	11.7%	***	38.2%	49.0%	***	41.8%	51.5%	**
% participated of middle or rich class	0.0%	8.7%	***	24.8%	34.2%	**	27.1%	37.7%	**
SHG functioning									
Meet at least monthly	0.44	0.48		0.46	0.71	***	0.79	0.75	*
Members make savings in meetings	0.97	0.88	***	1.00	1.00	*	0.92	0.88	**
Other activities									
Activities to reduce vulnerability	0.13	0.09		0.24	0.49	***	0.46	0.71	***
If access to food credit program	0.00	0.00		0.05	0.40	***	0.24	0.54	***
Marketing activities undertaken	0.03	0.04		0.05	0.10	***	0.14	0.22	***
Employment program /job training	--	--	--	--	--	--	0.17	0.22	**
Micro-credit activities									
Practice internal lending	0.30	0.28		0.38	0.55	***	0.90	0.86	
if yes, median internal loan size	7050	4500	--	6200	5926	--	10000	10900	--
if yes, median internal loan length	--	--	--	12	10	--	12	12	--
share for consumption smoothing	0.49	0.45		0.53	0.48		0.44	0.47	
share for investment	0.34	0.47	**	0.40	0.44		0.47	0.45	
Have access to CIF	0.00	0.04	***	0.00	0.25	***	0.55	0.62	**
if yes, median size	--	38143	--	--	34000	--	21000	40500	--
if yes, median length (months)	--	--	--	--	20	--	12	20	--
consumption smoothing main purpose	--	0.03	--	--	0.07	--	0.07	0.05	
investment main purpose	--	1.00	--	--	0.95	--	0.90	0.90	
Access bank loans	0.55	0.41	***	0.37	0.45	**	0.87	0.88	
if yes, median size	15000	15000	--	30000	24000	--	51000	50000	--
if yes, median length (months)	--	--	--	12	12	--	20	20	--
consumption smoothing main purpose	0.49	0.37	**	0.35	0.39		0.32	0.07	***
investment main purpose	0.67	0.77	*	0.73	0.81	*	0.64	0.88	***
Group's account balance	0.01	0.01		0.09	0.22	***			
Number of observations (SHGs)	179	691		294	1092		278	1085	

Source: Own computation from 2004 and 2006 SERP/CESS impact evaluation surveys.

Table 4. Logit regression of treatment

	Overall			Participants			Non-participants		
Variable	**Coeff.**	**(s.e.)**	**Sig.**	**Coeff.**	**(s.e.)**	**Sig.**	**Coeff.**	**(s.e.)**	**Sig.**
Household demographics									
Household lived in hamlet	-0.020	0.126		0.054	0.214		-0.114	0.161	
Scheduled tribe/caste	0.777	0.179	***	0.974	0.336	***	0.465	0.217	**
Backward caste	0.235	0.152		0.166	0.301		0.219	0.180	
Household size	0.157	0.034	***	0.111	0.054	**	0.174	0.044	***
Household female headed	-0.214	0.157		-0.184	0.269		-0.245	0.198	
Some member can write	0.030	0.137		-0.155	0.242		0.064	0.171	
Located in Telangana	-0.646	0.147	***	-0.639	0.225	***	-0.706	0.199	***
Located in Rayalaseema	0.338	0.131	***	1.353	0.295	***	0.070	0.164	
Household initial conditions									
Poorest of poor household	0.352	0.153	**	0.412	0.263		0.286	0.195	
Poor household	0.105	0.139		0.072	0.240		0.110	0.177	
Land ownership	0.217	0.117	*	0.361	0.199	*	0.022	0.149	
Consumption p.c. (10,000Rs/year)	-0.164	0.123		0.000	0.000		0.000	0.000	
Energy intake p.c. (1,000Kcal/day)	-0.594	0.236	**	0.000	0.000	***	0.000	0.000	
Protein intake p.c. (g/day)	0.044	0.010	***	0.074	0.017	***	0.025	0.013	*
Total non-financial asset p.c. (10,000Rs)	0.159	0.123		0.324	0.263		0.082	0.136	
Constant	-0.864	0.331	***	-0.525	0.572		-0.773	0.422	*
Pseudo R-squared	0.050			0.103			0.035		
Number of observations	2406			1111			1295		

Significance of coefficient is as follows: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Estimated average treatment effects

	Untrimmed sample, simple DD				
	Treated	**Control**	**DD.**	**(se)**	**Sig.**
Consumption p.c. (Rs/year)	1356	828	528	(292)	*
Food (Rs/year)	451	413	38	(139)	
Non-food (Rs/year)	905	416	490	(222)	**
Energy intake p.c. (Kcal/day)	177	232	-55	(68)	
Protein intake p.c. (g/day)	-0.78	0.28	-1.06	(1.51)	
Non-financial asset p.c. (Rs)	932	472	460	(234)	**
No. of obs.	1880	526			
	Trimmed sample, PS weighted DD				
	Treated	**Control**	**DD.**	**(se)**	**Sig.**
Consumption p.c. (Rs/year)	1414	1059	355	(295)	
Food (Rs/year)	518	451	67	(153)	
Non-food (Rs/year)	896	608	288	(228)	
Energy intake p.c. (Kcal/day)	236	210	26	(78)	
Protein intake p.c. (g/day)	1.17	-0.74	1.91	(1.79)	
Non-financial asset p.c. (Rs)	926	345	581	(273)	**
No. of obs.	1683	516			

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Impact on SHG participants and non-participants

	Untrimmed sample, simple DD				
	Participants			**Non-participants**	
Consumption p.c. (Rs/year)	1103	(400)	***	195	(423)
Food (Rs/year)	257	(175)	(*)	-89	(190)
Non-food (Rs/year)	846	(296)	***	283	(343)
Energy intake p.c. (Kcal/day)	94	(86)		-132	(91)
Protein intake p.c. (g/day)	1.96	(1.86)		-2.58	(2.03)
Non-financial asset p.c. (Rs)	711	(289)	***	340	(345)
No. of obs.	920+191=1111			962+333=1295	
	Trimmed sample, PS weighted DD				
	Participants			**Non-participants**	
Consumption p.c. (Rs/year)	864	(384)	*	-19	(446)
Food (Rs/year)	345	(219)	(*)	-181	(210)
Non-food (Rs/year)	519	(252)	*	163	(365)
Energy intake p.c. (Kcal/day)	210	(110)	*	-84	(102)
Protein intake p.c. (g/day)	6.99	(2.31)	***	-1.61	(2.40)
Non-financial asset p.c. (Rs)	720	(311)	**	231	(399)
No. of obs.	664+176=840			908+332=1240	

* significant at 10%; ** significant at 5%; *** significant at 1% for two-sided test; (*) significant at 10% for one-sided test

Table 7: Heterogeneous impact for poorest of the poor (POP), poor and non-poor SHG participants

	POP			Poor			Non-poor		
Untrimmed sample, simple DD									
Consumption p.c. (Rs/year)	615	(425)		819	(438)	*	1728	(702)	**
Food (Rs/year)	53	(224)		120	(231)		511	(387)	(*)
Non-food (Rs/year)	562	(314)	*	699	(341)	**	1217	(433)	***
Energy intake p.c. (Kcal/day)	176	(116)		77	(107)		18	(204)	
Protein intake p.c. (g/day)	2.14	(2.92)		0.91	(2.49)		1.73	(3.66)	
Non-financial asset p.c. (Rs)	558	(215)	***	428	(377)		1219	(585)	**
No. of obs.	407+73=480			308+71=379			205+47=252		
Trimmed sample, PS weighted DD									
Consumption p.c. (Rs/year)	677	(455)	(*)	1218	(524)	**	-143	(1317)	
Food (Rs/year)	295	(281)		511	(252)	**	-289	(679)	
Non-food (Rs/year)	382	(293)	(*)	707	(425)	*	146	(728)	
Energy intake p.c. (Kcal/day)	286	(144)	***	321	(111)	***	-101	(326)	
Protein intake p.c. (g/day)	6.85	(3.87)	*	7.54	(2.32)	***	4.21	(5.33)	
Non-financial asset p.c. (Rs)	757	(257)	***	1194	(440)	***	1066	(703)	(*)
No. of obs.	331+73=404 (.94)			178+65=243 (.90)			113+44=157 (.89)		

Significance of coefficient is as follows: * significant at 10%; ** significant at 5%; *** significant at 1% for two-sided test; (*) significant at 10% for one-sided test

Table 8: Power analysis of insignificant outcome variables for Non-members as well as POP and poor members

Variables	Non-members			Poorest of the Poor members			Non-poor members		
	Est. level	Probability is		Est. level	Probability is		Est. level	Probability is	
		10%	5%	(level)	10%	5%	(level)	10%	5%
Consumption p.c.	-19	1.0%	11.7%	677	51.2%	77.6%	-143	18.0%	30.4%
Food (Rs/year)	-181	0.1%	1.7%	295	42.6%	66.7%	-289	11.8%	21.0%
Non-food (Rs/year)	163	19.7%	42.9%	382	58.9%	77.8%	146	29.0%	43.0%
Energy intake p.c.	-84	0.0%	1.2%				-101	13.4%	23.9%
Protein intake p.c.	-1.61	0.1%	2.9%				4.21	44.8%	62.9%
Non-fin. asset p.c.	231	31.3%	53.6%				1066	82.6%	89.0%

Appendix tables

Table A.1. Balance check for all households, participates, and non-participants

	Overall		Participants		Non-participants	
Variable	**Simple**	**PS wgt.**	**Simple**	**PS wgt.**	**Simple**	**PS wgt.**
Household demographics						
Household lived in hamlet	0.033	0.018	0.068 *	0.029	0.006	0.016
Scheduled tribe/caste	0.074 **	-0.001	0.152 ***	0.020	0.002	-0.004
Backward caste	-0.037	0.021	-0.149 **	-0.047	0.036	0.021
Household size	0.490 ***	0.063	0.324	0.002	0.515 ***	-0.085
Household female headed	-0.021	0.008	-0.019	0.016	-0.021	0.015
Some member can write	0.024	0.009	0.005	-0.003	0.032	0.007
Located in Telangana	-0.060	-0.033	-0.042	-0.022	-0.099	-0.049
Located in Rayalaseema	0.111	0.052	0.199 ***	0.059	0.101	0.077
Household initial conditions						
Poorest of poor household	0.017	0.000	0.039	-0.004	-0.011	-0.001
Poor household	-0.002	-0.009	-0.036	0.003	0.002	-0.003
Land ownership	0.070 ***	0.008	0.099 **	-0.023	0.048	0.006
Consumption p.c. (10,000Rs/year)	-0.040	-0.037	-0.038	-0.006	-0.022	-0.017
Energy intake p.c. (10,000Kcal/day)	0.004	-0.005	0.004	-0.003	0.006	-0.000
Protein intake p.c. (g/day)	2.273	-1.236	3.525 **	-0.662	1.666	0.112
Total non-financial asset (10,000Rs)	0.005	-0.041	0.067	-0.069	-0.019	-0.040
Number of observations	2406	2232	1111	850	1295	1246

Significance of coefficient is as follows: * significant at 10%; ** significant at 5%; *** significant at 1% for two-sided test

Table A.2. Balance check for very poor participates, poor participants, and participants of middle or rich class

	Very poor			Poor			Not so poor/non-poor		
Variable	**Simple**		**PS wgt.**	**Simple**		**PS wgt.**	**Simple**		**PS wgt.**
Household demographics									
Household lived in hamlet	0.029		0.022	0.060		0.019	0.090	*	0.016
Scheduled tribe/caste	0.269	***	0.054	0.179	**	0.083	0.036		0.049
Backward caste	-0.240	***	-0.030	-0.090		-0.093	-0.165	**	-0.116
Household size	0.302		-0.064	0.443	**	-0.189	0.047		0.003
Household female headed	-0.082		-0.009	-0.005		-0.008	0.008		0.018
Some member can write	0.039		0.025	-0.044		-0.047	0.048		0.039
Located in Telangana	0.155	*	0.035	-0.064		-0.003	-0.141		0.037
Located in Rayalaseema	0.069		-0.019	0.194	***	0.017	* 0.287	***	-0.018
Household initial conditions									
Land ownership	0.220	***	0.036	0.076		0.034	0.054		-0.032
Consumption p.c. (10,000Rs/year)	-0.012		-0.024	-0.018		0.004	-0.062		0.075
Energy intake p.c. (10,000Kcal/day)	0.003		-0.010	0.014	*	0.003	-0.001		0.002
Protein intake p.c. (g/day)	3.498		-2.610	5.823	***	0.981	2.120		0.047
Total non-financial asset (10,000Rs)	0.075	***	-0.008	0.037		-0.013	0.147	*	0.024
Number of observations	480		411	379		239	257		146

Significance of coefficient is as follows: * significant at 10%; ** significant at 5%; *** significant at 1% for two-sided test

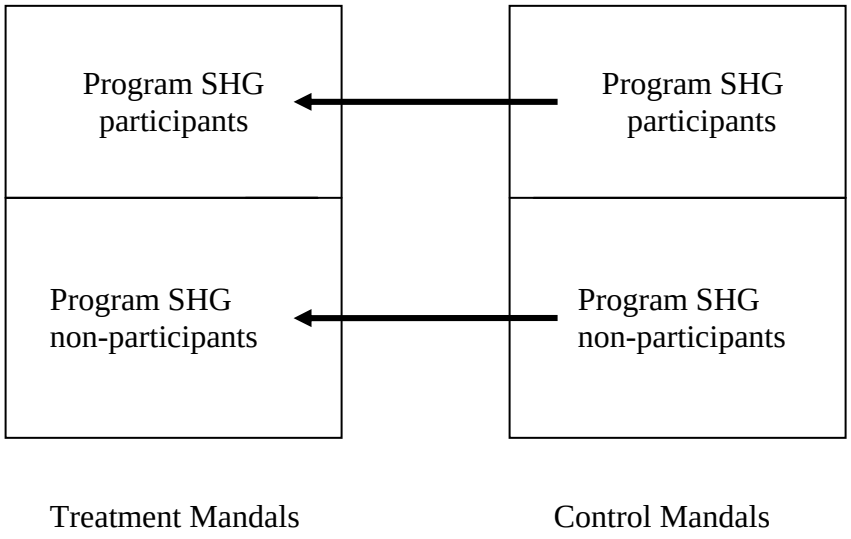
Table A.3. Means of outcome variables for program SHG participants and non-participants at the two survey dates

Variable	Participants				Non-participants			
	Control		Treated		Control		Treated	
	03/04	05/06	03/04	05/06	03/04	05/06	03/04	05/06
Consumption p.c. (Rs/year)	7606	7935	6928	8363	8086	9179	7479	8771
Food (Rs/year)	3777	4005	3632	4116	3943	4454	3747	4170
Non-food (Rs/year)	3829	3931	3295	4247	4143	4725	3732	4601
Energy intake p.c. (Kcal/day)	2092	2195	2119	2310	2121	2419	2165	2326
Protein intake p.c. (g/day)	48	45	51	50	49	51	50	49
Non-financial asset p.c. (Rs)	2864	3016	3651	4534	3270	3904	3349	4337
Number of observations	190		921		333		962	

Table A.4. Means of outcome variables for program SHG participants at different poverty levels at the two survey dates

Variable	Very poor				Poor				Non-poor			
	Control		Treated		Control		Treated		Control		Treated	
	03/04	05/06	03/04	05/06	03/04	05/06	03/04	05/06	03/04	05/06	03/04	05/06
Consumption p.c. (Rs/year)	6422	6972	6179	7345	6810	7388	6550	7946	9066	9035	7840	9538
Food (Rs/year)	3358	3748	3337	3780	3455	3826	3469	3960	4331	4327	3993	4501
Non-food (Rs/year)	3064	3225	2842	3564	3356	3562	3081	3986	4735	4708	3847	5037
Energy intake p.c. (Kcal/day)	2051	1996	2053	2174	1959	2063	2092	2273	2232	2436	2190	2412
Protein intake p.c. (g/day)	47	43	50	48	45	43	51	50	50	48	52	52
Non-financial asset p.c. (Rs)	1203	1385	1893	2632	2525	2933	2792	3628	4289	4198	5562	6690
Number of observations	73		407		71		308		47		205	

Figure 1A: Treated and control groups in estimating ATEs on program SHG participants and non-participants



References:

Ahlin, C. and N. Jiang. 2008. "Can Micro-credit Bring Development?" *Journal of Development Economics 86* (1): 1-21.

Basu, P. and P. Srivastava. 2005. "Scaling-up Microfinance for India's Rural Poor." World Bank Policy Research Working Paper 3646. Washington, DC: World Bank.

Chen, S., R. Mu, and M. Ravallion. 2007. "Are There Lasting Impacts of Aid to Poor Areas? Evidence from Rural China." Policy Research Working Paper 4084. Washington DC: World Bank.

Crump, R., V. Hotz, G. W. Imbens, and O. Mitnik. 2007. "Moving the Goalposts: Addressing Limited Overlap in Estimation of Average Treatment Effects by Changing the Estimand." NBER Technical Working Paper 330. Cambridge, MA: National Bureau of Economic Research.

Deininger, K. and Y. Liu. 2009. "Economic and social impacts of self-help groups in India." World Bank Policy Research Working Paper. Washington, DC: World Bank.

Garikipati, S. 2008. "The impact of lending to women on hosuehold vulnerability and women's empowerment: Evidence from India." *World Development forthcoming*.

Gopalan, G., B. V. Rama Shastri, and B. C. Balasubramanian. 2004. "Nutritive Value of Indian Food." . Hyderabad: National Institute of Nutrition, Indian Council of Medical Research.

Hirano, K., G. W. Imbens and G. Ridder. 2003. "Efficient estimation of average treatment effects using the estimated propensity score." *Econometrica 71* (4): 1161-89.

Kochar, A. 2005. "Can targeted food programs improve nutrition? An empirical analysis of India's public distribution system." *Economic Development and Cultural Change 54* (1): 203-35.

Lastarria-Cornhiel, S. and Y. Shimamura. 2008. "Social well-being outcomes of rural microfinance in Andhra Pradesh." Working Paper. Madison, WI: University of Wisconsing.

Nair, A. 2005. "Sustainability of microfinance self help groups in India: would federating help?" World Bank Policy Research Working Paper 3516. Washington, DC: World Bank.

Reserve Bank of India. 2008. "Report on trend and progress of banking in India, 2007-08." . Mumbai: Reserve Bank of India.

Shah, M., R. Rao and P. S. V. Shankar. 2007. "Rural Credit in 20th Century India: Overview of History and Perspectives." *Economic and Political Weekly 42* (15): 1351-64.

Sinha, F. 2006. "Self help groups in India: A study of the lights and shades." . Noida and Hyderabad: APMAS and EDA Rural Systems.

Swain, R. B. and Y. Wallentin. 2008. "Does microfinance empower women? Evidence from self help groups in India." Working Paper 2007-24. Uppsala, Sweden: Department of Economics, Uppsala University.

van de Walle, D. and R. Mu. 2007. "Fungibility and the flypaper effect of project aid: Micro-evidence for Vietnam." *Journal of Development Economics 84* (2): 667-85.

World Bank. 2007. "Andhra Pradesh District Poverty Initiatives Project, Implementation Completion and Results Report". Washington DC: World Bank Sustainable Develoopment Sector Unit South Asia Region.